Remarks/Arguments

Claims 1-3, 5-14 and 16–26 are pending in the current application. Claims 1-3, 5-14 and 16–26 stand rejected. In this response, claims 1, 12 and 22 are amended.

35 U.S.C. §103

In the Office Action, the Examiner rejected claims 1-3, 5-14 and 16–26 under 35 U.S.C. §103(a) as being unpatentable over Modafferi, U.S. Patent No. 4,771,466 in view of Tanida, et al., US 5,243,656. In the final rejection, the Examiner cited that Modafferi discloses, in column 2, lines 60 – 62, Applicant's recitation of:

> "impedances of the first and second components are selected such that a phase difference at the crossover frequency between respective responses of the first and second loudspeakers is no greater than 60 degrees".

Applicant respectfully suggests that the cited disclosure does not anticipate our claim element. Note first that Modafferi discusses the phase response vs frequency of a single signal, the combined high pass and low pass signals (note the equation at column 2 line 52: $f_3(s) = f_1(s) + f_2(s)$), whereas the independent claims of our application recite:

> "a phase difference at the crossover frequency between respective responses of the first and second loudspeakers...".

Contrasted to Modafferi, we claim the phase difference between two different signals (high frequency filtered signal and low frequency filtered signal) at a fixed frequency, that frequency being the crossover frequency or the frequency where the amplitude response of the high pass signal and the low pass signal are equal, whereas Modafferi discloses characteristics of a single signal.

Note also that Modafferi discloses, in column 2, lines 54-62:

> "If an ideal woofer were connected to a cross-over network having the transfer response of Equation (3) and an ideal tweeter were connected to a crossover network having the transfer response of Equation (4), and the woofer and tweeter were combined in a single system, the result would be a "perfect" loudspeaker system. Its amplitude response would be perfectly flat for all frequencies and there would be no phase shift at any frequency."

whereas Applicant's claims recite:

> "...impedances of the first and second components are selected such that a phase difference at the crossover frequency between respective responses of the first and second loudspeakers is equal to or greater than 38 degrees and not greater than 60 degrees."

In view of the above observations, the disclosure in Modafferi column 2, lines 60-62, does not read on Applicant's claims for both the reasons that Modafferi discusses phase response versus frequency of a single signal, not two separate signals as Applicant claims, and that the disclosure in Modafferi is that the phase response versus frequency of a single signal may be zero degrees, not that a phase difference at the crossover frequency between respective responses of the first and second loudspeakers is equal to or greater than 38 degrees and not greater than 60 degrees, as Applicant claims.

In the Advisory Action, the Examiner cites Modafferi, column 12, lines 7-17, as teaching of a phase difference. The cited section of Modafferi discloses:

> "The phase response of the invention embodiments of FIGS. 10 and 15a and 15b can be shown by phase and time measurements familiar to those skilled in the art to fulfill the intent of the invention as contained in the idea statement 1.8. Acoustical measurements taken on the aforementioned embodiments show all drivers operating in the same relative phase at the crossover frequencies with, at most, phase rotations of 2n.pi. radians. Translated to delay error, this phase shift never exceeds a maximum delay error of one millisecond, for frequencies above 175 Hz."

Applicant respectfully asserts that Modafferi column 12, lines 7-17, does not read on Applicant's claims. The cited reference refers to figures 10, 15a and 15b, which are the order crossover networks, not to Applicant's claimed first order crossover, and further that the cited reference shows all drivers operating in the same relative phase at the crossover frequencies, not as in Applicant's claimed:

> "the low-pass and the high-pass filters are first-order filters and wherein the first component is coupled in series to the first loudspeaker connected in a first polarity, the second component is coupled in series to the second loudspeaker connected in a second polarity, and the second polarity is an inverse of the first polarity, and impedances of the first and second components are selected such that a phase difference at the crossover frequency between respective responses of the first and second loudspeakers is equal to or greater than 38 degrees and not greater than 60 degrees".

Applicant respectfully asserts the rejection under 35 U.S.C. §103(a) as being unpatentable over Modafferi is traversed. Withdrawal of the rejection is respectfully requested.

The Examiner cites Tanida, column 2, lines 29-43, as anticipating Applicant's claims. The cited reference discloses:

> "This embodiment is applied to a two channel audio circuit. The circuit consists of a signal amplifier 1, an inverted signal amplifier 2, power amplifiers 3, 4 speakers 5, 6 and condensers C_1 and C_2. One input channel, IN_1, is connected to the gain amplifier 1 and fed to power amplifier 3. The power amplifier 3 is connected through condenser C_1 to the positive (+) terminal of the speaker 5. The other input channel, IN_2 is connected through the inverted amplifier 2 to the other power amplifier 4. The output of the power amplifier 4 is fed through condenser C_2 to the negative (-) terminal of the speaker 6. The (-) terminal of speaker 5 and the (+) terminal of speaker 6 are connected to ground. It will be noted that the polarities of speakers 5 and 6 are reversed."

Please note that the cited reference discloses an:

> "embodiment is applied to a two channel audio circuit" wherein "One input channel, $\underline{IN_1}$, is connected to the gain amplifier 1 and fed to power amplifier 3. The power amplifier 3 is connected through condenser C_1 to the positive (+) terminal of the speaker 5. The other input channel, $\underline{IN_2}$ is connected through the inverted amplifier 2 to the other power amplifier 4. The output of the power amplifier 4 is fed through condenser C_2 to the negative (-) terminal of the speaker 6",

whereas Applicant's claims recite:

> "a first component of the input audio signal coupled to the first loudspeaker to form a low-pass filter for providing the first loudspeaker low frequency band signals; and a second component of the input audio signal coupled to the second loudspeaker to form a high-pass filter for providing the second loudspeaker high frequency band signals,...".

Note that Tanida discloses two input signals, with one of the two input signals experiencing a double phase inversion (the first due to inverting amplifier 2, and the second through speaker 6). By contrast, Applicant's claims are directed to:

"a first component of the input audio signal...; and

'a second component of the input audio signal...".

If one needed to design a system wherein a first component of the input signal that has a -60 degree phase shift at a particular frequency is 60 degrees displaced from a second component of the input signal that has a +60 degree phase shift at a that same particular frequency, one would employ an inventive aspect of the present invention, that being to invert (once), one component of the input signal. For a detailed explanation, please see the application, page 7, line 18 – page 8 line 6:

> "With this set of values, the low pass filter produces a positive phase shift of about 60 degrees and the high-pass filter produces a negative phase shift of about 60 degrees. However, since the low-pass filter is connected to the positive terminal of the woofer 150 but the high-pass filter is connected to the negative terminal of the tweeter 110, i.e., the polarity of the tweeter 110 is inverted with respect to the woofer 160, the tweeter 110 actually adds a positive phase shift of 180 degrees to the high-pass filter. The reason that inverting the polarity adds 180 degrees to the high-pass filter is that the incoming signals are essentially reversed. For example, a positive input would become negative, moving a cone of the tweeter 110 in an opposite direction. Thus, the resulting phase shift for the high-pass filter is actually a positive phase shift of about 120 degrees. Thus, the phase difference between the response of the low-pass filter and the response of high-pass filter is about 60 degrees."

Tanida discloses no first-order crossover network for dividing an input audio signal, no first component to form a low-pass filter, no second component to form a high-pass filter and no component of the input audio signal to a first speaker in a first polarity and no component of the input audio signal to a second speaker in a second polarity, and the second polarity being the inverse of the first polarity. Rather, Tanida discloses to improve the power efficiency in a multichannel audio circuit wherein a plurality of input signals are

supplied to corresponding amplifiers having at least one of the input signals inverted and the speaker connected to the inverted signal connected in a polarity opposite the other speakers. Because of this double inversion, the net result is that the plurality of signals radiated from the corresponding speakers are all in the same phase or polarity. Note that there is no dividing of an input signal, one component being applied to a speaker in a polarity which is inverse to connection of a second component of the input audio signal. Tanida merely inverts one signal of a multichannel audio circuit twice, once in an amplifier and a second time by inverse connection of its corresponding speaker.

There is no suggestion in Modafferi or in Tanida, either singly or together, of:

> "A first-order crossover network for dividing an input audio signal into high and low frequency bands at a crossover frequency in a loudspeaker system having first and second loudspeakers having respective impedance, each loudspeaker having positive and negative terminals, the first-order crossover network comprising:
>
> 'a first component of the input audio signal coupled to the first loudspeaker to form a low-pass filter for providing the first loudspeaker low frequency band signals; and
>
> 'a second component of the input audio signal coupled to the second loudspeaker to form a high-pass filter for providing the second loudspeaker high frequency band signals, wherein
>
> > 'the low-pass and the high-pass filters are first-order filters and wherein the first component is coupled in series to the first loudspeaker connected in a first polarity, the second component is coupled in series to the second loudspeaker connected in a second polarity, and the second polarity is an inverse of the first polarity, and impedances of the first and second components are selected such that a phase difference at the crossover frequency between respective responses of the first and second loudspeakers is equal to or greater than 38 degrees and not greater than 60 degrees.",

as is recited in claim 1. Applicant respectfully asserts the rejection is traversed.

Applicant respectfully requests the rejection of claims 1, 12 and 22 under 35 U.S.C. §103(a) be withdrawn. Claims 2–3, 5-11, 13-21 and 23–26, being properly drawn to independent claims believed to be allowable are also allowable. Withdrawal of rejections of dependent claims 2–3, 5-11, 13-21 and 23–26 is respectfully requested.

Conclusion

Having fully addressed the Examiner's objections and rejections, it is believed that, in view of the preceding Remarks, this application stands in condition for allowance. Accordingly then, reconsideration and allowance are respectfully solicited. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the Applicant's attorney (Robert D. Shedd) at (609) 734-6828, so that a mutually convenient date and time for a telephonic interview may be scheduled.

Please charge the $130 fee for the Petition for a One Month Extension, and any other costs that may be due, and/or credit any overpayments, to Deposit Account No. 07-0832.

Respectfully submitted,
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CERTIFICATE OF MAILING 37 C.F.R. § 1.8(a)

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December 17, 2009
Date

Patricia M. Fedorowycz